

## CLAIMS

What is claimed is:

1 1. An optical switching device, comprising:  
2 an optical cavity having an input port and an output port; and  
3 a phase modulator disposed within the optical cavity, the phase modulator  
4 having an input port and an output port respectively coupled to the input port and  
5 the output port of the optical cavity, wherein the phase modulator introduced a  
6 phase shift in a portion of an optical signal propagating in the optical cavity while the  
7 component signal is propagating in one direction, and introduces a phase shift in  
8 another portion of the optical signal propagating in another direction.

1 2. The optical switching device of claim 1, wherein the phase modulator  
2 comprises a Mach-Zehnder interferometer (MZI).

1 3. The optical switching device of claim 2, wherein the phase modulator  
2 comprises an electro-optic phase shifter.

1 4. The optical switching device of claim 2, wherein the phase modulator  
2 comprises a thermo-optic phase shifter.

1 5. The optical switching device of claim 2, wherein the phase modulator  
2 comprises a stress-optic phase shifter.

1 6. The optical switching device of claim 2 wherein the MZI comprises a  
2 Y-coupler.

1 7. The optical switching device of claim 2, wherein a first reflective facet and a  
2 second reflective facet are used in implementing the optical cavity.

1 8. The optical switching device of claim 7, wherein the first facet comprises a  
2 coating having a plurality of adjoining layers, each layer having an index of  
3 refraction that is different from that of an adjoining layer, the refractive indices  
4 alternating between higher and lower refractive indices.

1 9. The optical switching device of claim 7, wherein the first facet comprises a  
2 reflective grating.

1 10. An optical switching device, comprising:  
2 an optical cavity having an input port and an output port; and  
3 means, disposed within the optical cavity, for modulating a phase of a portion  
4 of an optical signal propagating in the optical cavity.

1 11. The optical switching device of claim 10, wherein the means for modulating  
2 comprises a Mach-Zehnder interferometer (MZI).

1 12. The optical switching device of claim 11, wherein the means for modulating  
2 comprises an electro-optic phase shifter.

1 13. The optical switching device of claim 11, wherein the means for modulating  
2 comprises a thermo-optic phase shifter.

1 14. The optical switching device of claim 11, wherein the means for modulating  
2 comprises a stress-optic phase shifter.

1 15. The optical switching device of claim 11 wherein the MZI comprises a  
2 Y-coupler.

1 16. The optical switching device of claim 11, wherein a first reflective facet and a  
2 second reflective facet are used in implementing the optical cavity.

1 17. The optical switching device of claim 16, wherein the first facet comprises a  
2 coating having a plurality of adjoining layers, each layer having an index of  
3 refraction that is different from that of an adjoining layer, the refractive indices  
4 alternating between higher and lower refractive indices.

1 18. The optical switching device of claim 16, wherein the first facet comprises a  
2 reflective grating.

1 19. A planar optical integrated optical circuit, comprising:  
2 a first facet having a reflectance less than one;  
3 a second facet having a reflectance less than one;  
4 a first optical combiner coupled to the first facet;  
5 a second optical combiner coupled to the second facet;

6 a first arm having one end coupled to the first optical combiner and another  
7 end coupled to the second optical combiner;  
8 a second arm having one end coupled to the first optical combiner and  
9 another end coupled to the second optical combiner; and  
10 a phase shifter operatively coupled to the first and second arms.

1 20. The planar optical integrated optical circuit of claim 19, wherein the first and  
2 second facets each comprise a reflective grating.

1 21. The planar optical integrated optical circuit of claim 19, wherein the phase  
2 shifter is an electro-optic phase shifter, a thermo-optic phase shifter, or a stress-  
3 optic phase shifter.

1 22. A method, comprising:  
2 propagating an optical signal into an optical cavity;  
3 causing a portion of the optical signal to propagate in one optical path and  
4 another portion of the optical signal to propagate in another optical path;  
5 selectively introducing a phase difference between the portions of the optical  
6 signal;  
7 combining the portions of the optical signal; and  
8 propagating a portion of the combined signal out of the optical cavity.

1 23. The method of claim 22, wherein the optical cavity is a resonant optical cavity  
2 with respect to the optical signal.

1 24. The method of claim 22 wherein a reflective grating is used to form a part of  
2 the optical cavity.

1 25. The method of claim 22, wherein a Mach-Zendher Interferometer (MZI) is  
2 used to selectively introduce the phase difference.

1 26. The method of claim 25, wherein the MZI comprises a phase shifter selected  
2 from the group comprising an electro-optic phase shifter, a thermo-optic phase  
3 shifter, or a stress-optic phase shifter.

1 27. An optical switching device, comprising:  
2 an optical cavity;  
3 means for propagating an optical signal into the optical cavity;  
4 means for causing a portion of the optical signal to propagate in one optical  
5 path and another portion of the optical signal to propagate in another optical path;  
6 means for selectively introducing a phase difference between the portions of  
7 the optical signal;  
8 means for combining the portions of the optical signal; and  
9 means for propagating a portion of the combined signal out of the optical  
10 cavity.

1 28. The optical switching device of claim 27 wherein a reflective grating is used to  
2 form a part of the optical cavity.

1 29. The optical switching device of claim 27, wherein the means for selectively  
2 introducing a phase difference comprises a Mach-Zendher Interferometer (MZI).

- 1 30. The optical switching device of claim 29, wherein the MZI comprises a phase
- 2 shifter selected from the group comprising an electro-optic phase shifter, a thermo-
- 3 optic phase shifter, or a stress-optic phase shifter.

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